AC-003

Novel energy transfer mechanism in creation of bisolitons on Si(001) surfaces

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We developed single carrier spectroscopy and controllable arbitrary waveform to study solitons made up of phase kinks that resulting from the creation of local Si(100)-p(2×2) structure in the ground state of Si(100)-c(4×2). The programmed bias pulses to Si surface and the yield related to respective pulsesshows that the solitons were not induced by the direct excitation caused by tunneling electrons but the decay of quantum well state, produced by abrupt field switching. When the sample bias suddenly changes from positive to opposite, electrons near the quantum well move to compensate the non-equilibrium charge distribution and fill the quantum well. The decay of the quantum well provides excess energy to induce structural transition, the lifetime of the quantum well can be deduced from the soliton creation yield. The lifetime was increased with the bias and was on the order of a few hundred *n*sec. Such a fine control of bias pulse can be used to make artificial nano structure like 1 dimensional chain or laterally linked bisolitons.

AC-004

Single Spin Detection by Scanning Tunneling Microscopy

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There is a rising interest for a single spin detection, which should be the key technology for spin-electronics and quantum computers. Although there has been an active discussion for detecting and manipulating a single spin as a single information bit, there is few demonstration of thedetection of a single spin. In this report, recent researches towards the single spin detection using scanning tunneling microscope (STM) will be described.

First example is the detection of Larmor precession in the presence of a magnetic field which appears as a periodic noise in the tunneling current. STM has an intrinsic atomic resolution, thus a spin mapping with the atomic scale could be realized if tunneling electron can detect the single spin.[1] By monitoring the modulation of the tunneling current synchronized with the motion of the Larmor precession, we can obtain the chemical information of an isolated spin that will be future candidate for the realization of ESR-STM observation.

Second example is the detection of Kondo peaks of molecules adsorbed on surfaces at the cryogenic temperature by STM, focusing on the ‘molecular magnet’ of $LnPc_2$ molecules (Ln=Dy and Tb, Pc is phthalocyanine). A high resolutionSTS near the Fermi level can detect Kondo peaks with atomic-scale lateral resolution, which reveals the correlation between the electronic state of the molecule and the spin of the Ln atoms.

References

[1] Komeda, T.; Manassen, Y. *Appl. Phys. Lett.* **2008**, *92*, 212506.